

What is claimed is:

1. A non-contact IC card reading/writing apparatus comprising:

a loop antenna, which supplies both electric power and a transmission signal to a non-contact IC card by way of an electromagnetic induction effect and acquires a reception signal from the non-contact IC card by way of a load variation;

a resonant circuit, which resonates the loop antenna at a desirable frequency;

a wireless transmitter, which supplies both electric power and transmission data via the resonant circuit to the loop antenna; and

a wireless receiver, which acquires a reception signal from the loop antenna via the resonant circuit;

wherein data transmitted from the non-contact IC card is demodulated from the reception signal by a demodulating circuit; and

the resonant circuit, the wireless transmitter, and the wireless receiver are coupled to each other via a directional coupler.

2. A non-contact IC card reading/writing apparatus comprising:

a loop antenna, which supplies both electric power and a transmission signal to a non-contact IC card by way of an electromagnetic induction effect and acquires

reception signal from the non-contact IC card by way of a load variation;

a resonant circuit, which resonates the loop antenna at a desirable frequency;

a wireless transmitter, which supplies both electric power and transmission data via said resonant circuit to the loop antenna; and

a wireless receiver, which acquires a reception signal from the loop antenna via the resonant circuit unit;

wherein data transmitted from the non-contact IC card is demodulated from the reception signal by a demodulating circuit; and

the resonant circuit, the wireless transmitter, and said wireless receiving unit are coupled to each other via a circulator.

3. A non-contact IC card reading/writing apparatus comprising:

a loop antenna, which supplies both electric power and a transmission signal to a non-contact IC card by way of an electromagnetic induction effect and acquires a reception signal from the non-contact IC card by way of a load variation;

a resonant circuit, which resonates the loop antenna at a desirable frequency;

a wireless transmitter, which supplies both electric power and transmission data via the resonant circuit to the

loop antenna; and

a wireless receiver, which acquires a reception signal from the loop antenna via the resonant circuit unit;

wherein data transmitted from the non-contact IC card is demodulated from the reception signal by a demodulating circuit;

the resonant circuit, the wireless transmitter, and the wireless receiver are coupled to each other via an isolator.

4. A non-contact IC card reading/writing apparatus comprising:

a loop antenna, which supplies both electric power and a transmission signal to a non-contact IC card by way of an electromagnetic induction effect and acquires a reception signal from the non-contact IC card by way of a load variation;

a first resonant circuit, resonates the loop antenna at a first desirable frequency;

a wireless transmitter, which supplies both electric power and transmission data via the first resonant circuit to the loop antenna; and

a wireless receiver, acquires a reception signal from the loop antenna via a second resonant circuit which is connected to the loop antenna by way of a coupling capacitor and is resonated at a second desirable frequency;

wherein data transmitted from the non-contact IC card

is demodulated from the reception signal by a demodulating circuit.

5. The non-contact IC card reading/writing apparatus as claimed in claim 4 wherein:

a resonant frequency of the first resonant circuit is set to a frequency of a carrier wave used to transfer both the electric power and the transmission signal; and a resonant frequency of the second resonant circuit is set to a frequency of a modulated subcarrier which is produced based upon a load variation occurred on the side of the non-contact IC card.

6. The non-contact IC card reading/writing apparatus as claimed in any one of claim 4 and claim 5 wherein:

a second coil is provided in the vicinity of a first coil which constitutes the second resonant circuit and is coupled to the first coil by way of a mutual induction effect; one terminal of the first coil is connected to a first ground;

one terminal of the second coil is connected to a second ground; and the ground of both the wireless transmitter and an antenna circuit is separated from the ground of the wireless receiving unit.

7. The non-contact IC card reading/writing apparatus as claimed in any one of claim 4 to claim 6 wherein:

both a turn number "n1" of the first coil which

constitutes the second resonant circuit and a turn number "n2" of the second coil which is coupled to the first coil by way of the mutual induction effect are selected in such a manner that said turn number "n1" is matched to an output impedance "Z1" of the second resonant circuit, and the turn number "n2" is matched to an input impedance of the wireless receiver; and both the first coil and the second coil own an impedance converting function.

8. The non-contact IC card reading/writing apparatus as claimed in any one of claim 4 to claim 7 wherein:

both a first capacitor "C1" and a second capacitor "C2" are series-connected between one terminal and the other terminal of the second coil;

an output signal is derived from a joint point between the first capacitor C1 and the second capacitor C2; and both the first capacitor C1 and the second capacitor C2 own an impedance converting function.

9. The non-contact IC card reading/writing apparatus as claimed in any one of claim 4 to claim 7 wherein:

the resonant frequency of the second resonant circuit is set to a frequency of a lower-sided modulated subcarrier within both side bands which are formed based upon a load variation occurred on the side of the non-contact IC card.

10. The non-contact IC card reading/writing apparatus as

claimed in any one of claim 4 to claim 7 and claim 8 wherein:

the resonant frequency of the second resonant circuit is set to a frequency of an upper-sided modulated subcarrier within both side bands which are formed based upon a load variation occurred on the side of the non-contact IC card.

11. The non-contact IC card reading/writing apparatus as claimed in any one of claim 4 to claim 8 wherein:

the resonant frequency of the second resonant circuit is set to a frequency range which covers a plurality of modulated subcarriers formed based upon a load variation occurred on the side of the non-contact IC card.

13. The non-contact IC card reading/writing apparatus as claimed in any one of claim 4 to claim 12 wherein:

an intermediate frequency transformer is provided between the second resonant circuit and the wireless receiver; and the ground of the second resonant circuit is separated from the ground of the wireless receiver.